

Determining the Most Cost Effective Method to Eliminate Over-Weight Concerns on SCFC Transport Trucks

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Introduction

The SC Forestry Commission was created in 1927 with one of the primary responsibilities to protect the forestlands from wildfires. The main tool in the Forestry Commission's arsenal to combat wildfires has been, and continues to be, bulldozers equipped with blades and plows. Today, the Forestry Commission operates a fleet of over 180 fire suppression bulldozers.

The first mechanized equipment purchased for the suppression of wildfires was acquired in 1942. Seven John Deere farm tractors with disc tillers were put into service. The first bulldozers were purchased in 1947-48 when the Commission brought 4 crawlers into the fleet along with another 31 farm tractors. (See photo #4). From that moment forward, bulldozers have been the tool of choice for wildland fire suppression. These first machines were quite small and did not weigh a great amount. Over the years, protective cabs were built to protect the operators from rollover and screens were added to protect the operator from limbs and vines. Just recently, in 2012, the very first fully enclosed cabs were purchased on Caterpillar D5K dozers. These units provide a maximum amount of protection for the firefighter including air conditioning/heat, air filtration, glass windows and doors with protective screens over the glass, and sealed cabs to keep out the smoke.

Problem Statement

With the addition of all these safety features, as well as the increase in overall size of the dozers, the weight of the machine has steadily increased year after year. This has caused an issue with the Gross Vehicle Weight and the axle weight of each hauling unit that carries these large dozers to fires. This project was chosen because the Forestry Commission is now operating

vehicles that exceed maximum axle weight limits on some highways. The time has come to make changes to our hauling units so we can get our dozers to fires safely and within legal limits, and we can minimize impact on highways, secondary roads, and bridges.

Data Collection

There are currently two different configurations of hauling units that the Forestry Commission utilizes. The first, and most widely used, is a 10-wheel straight frame truck with a flat bed. The second is an 18-wheel tractor-trailer configuration, most often incorporating a tandem-axle truck tractor with a tandem-axle trailer that is 30-40 feet in length.

For this project, I will be comparing the following 2 fire suppression units:

- 10-Wheel Straight Truck with Dozer (Photo #1)
 - 2018 Freightliner M2 106 with Flat Bed Hauling Body
 - 2017 Caterpillar D4K2 Dozer with Fesco P-3H-JR Pull-Type Fire Plow
- 18-Wheel Tractor Trailer with Dozer (Photo #2)
 - 2015 Freightliner M2 112 with Witzco Challenger Lowboy Trailer
 - 2017 Caterpillar D4K2 Dozer with Fesco P-3H-JR Pull-Type Fire Plow

I began by weighing each configuration loaded and unloaded. When analyzing the data, we will look at the following components:

Steer Axle – The weight of the front axle of the hauling vehicle. This axle is used to steer the vehicle.

Drive Axle – The weight of the rear tandem axles on the hauling vehicle. The weight of these 2 axles is expressed in a single weight measurement (both axles combined). These axles power the hauling vehicle forward and backward.

Trailer Axle – The weight of the tandem axles on the trailer that is pulled behind the truck tractor in the 18-Wheel Tractor-Trailer Configuration.

Gross Weight – The combined total weight of the vehicle/equipment being weighed.

Data Analysis

Weight of 10-Wheel Straight Truck Configuration

	Unloaded (Lbs.)	Loaded (Lbs.)
Steer Axle	<i>8,160</i>	<i>11,640</i>
Drive Axle	<i>15,780</i>	<i>38,980</i>
Trailer Axle	<i>N/A</i>	<i>N/A</i>
Gross Weight	<i>23,940</i>	<i>50,620</i>

Weight of Tractor Trailer Configuration

	Unloaded (Lbs.)	Loaded (Lbs.)
Steer Axle	<i>9,860</i>	<i>9,680</i>
Drive Axle	<i>14,400</i>	<i>25,840</i>
Trailer Axle	<i>12,980</i>	<i>28,340</i>
Gross Weight	<i>37,240</i>	<i>63,860</i>

Caterpillar D4K2 Bulldozer Weight (Fully Equipped with Forestry Protection Package)

24,320 Lbs.

Fesco P-3H-JR Pull-Type Fire Plow Weight

2,300 Lbs.

One key finding in the data that was collected is the Loaded Drive Axle Weight of the 10-wheel straight truck was found to be 38,980lbs, which exceeds legal weight restrictions (32,000lbs.) posted on many highways and secondary roads within South Carolina and other Southeastern states.

I spoke with Captain Dean Dill with the South Carolina State Transport Police about this issue. He stated, “Road machinery / heavy equipment get the 90,000lb. exemption on and off the interstate. Also, the axle weights are exempt, so there are no limitations on them. This applies in South Carolina.” (Photo #5)₁

According to this explanation, both the 10-Wheel Straight Truck configuration and the 18-Wheel Tractor Trailer configuration have acceptable loaded weights anywhere in the state of South Carolina. This does not mean that we can just overlook the problem and move on however. The SC Forestry Commission is part of the Southeastern Interstate Forest Fire Protection Compact which means our fire suppression units can be called to any of the 9 Southeastern States listed in the Compact. These states include Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, Virginia, and West Virginia. The purpose of this compact is to promote effective prevention and control of forest fires in the southeastern region of the United States by the development of integrated forest fire plans, by the maintenance of adequate forest fire fighting services by the member states, by providing for mutual aid in fighting forest fires among the compacting states of the region and with states which are party to other regional forest fire protection compacts or agreements, and for more adequate forest protection.₂

When called upon to respond to fires in other Southeastern States, our fire suppression units must be within legal load limits in each state they are traveling through. This does not

become a problem until the vehicle leaves the interstate and travels on state highways and county roads. While on the interstate highway systems, our vehicles are considered to be Emergency Vehicles designed to be used under emergency conditions to transport personnel and equipment, and to support the suppression of fires and mitigation of other hazardous situations.³

When looking at the Gross Weight of both vehicle configurations, the 18-Wheel Tractor Trailer appears to be well under the maximum legal limit of both Drive Axle weight and Gross Weight. Therefore, this configuration seems to be the best choice based on weight. But, we also have to consider the length of the vehicle:

Length of 18-Wheel Tractor Trailer – 65 ½ Feet

Length of 10-Wheel Straight Truck – 36 ½ Feet

Length of vehicle is of utmost importance when responding to wildfires. These fires do not always occur right off of a main highway with easy access. Most of the time, these fires occur down long, dead-end dirt roads or in neighborhoods with tight turns and small cul-de-sacs.

Therefore, the 10-Wheel Straight Truck is the ideal configuration for the South Carolina Forestry Commission fire suppression units.

So, in order to overcome the issue of having overweight Drive Axles on the 10-Wheel Straight Frame truck, the Forestry Commission will look into adding an air lift 3rd axle on the rear of the truck that is able to be lifted up out of the way when the vehicle is turning or weight restrictions do not require it to be on the ground.

Implementation Plan

The first step in adding the air lift 3rd axle to our transport trucks will be updating the specifications of the trucks so we will be able to order the correct equipment from the manufacturer. Currently we are ordering 56,000lb. Gross Vehicle Weight Rating (GVWR) trucks with tandem rear axles. The frames of these trucks will have to be lengthened to accommodate the addition of the 3rd axle.

After the truck specifications are amended, the specifications for the flat bed on the back of the truck will have to be changed to reflect the increase in truck frame length. We will also have to make sure that the flat bed does not interfere with lifting the 3rd axle.

The specification changes will probably take a couple of months. I have already spoken with representatives from Freightliner trucks where we purchased our last transports. They have started putting together the new specifications and I expect to see a rough draft of them within the next month. After that rough draft is complete, I will send these specifications to the flat bed manufacturer so their team of engineers can ensure the bed will not interfere with the lift mechanism on the 3rd axle.

An overall cost is not known at this time. However, I have budgeted an extra \$10,000 for each transport truck and an extra \$2,500 for each flat bed.

	<u>Current Price</u>	<u>Projected Price</u>
10-Wheel Straight Truck	\$91,168.00	\$102,000.00
Flat Bed	\$21,845.00	\$24,500.00

The added cost for these units is going to be a major obstacle. The Forestry Commission normally orders 12 new units each fiscal year. If these cost projections are correct, the total cost

of 12 units will increase by a total of approximately \$150,000 annually. This additional cost will have to be offset by ordering fewer than 12 units each year.

The Florida Division of Forestry has implemented these same changes in their transport trucks over the last several years. I have reached out to them for advice on what size lift axle to add to the trucks, location of lift axle, and other changes in the specifications that I might have overlooked. Their 10-wheel truck configuration can be seen in Photo #3. They have been very helpful in sharing information.

Other key stakeholders that I have been communicating with are the Regional Foresters and Unit Foresters within the Forestry Commission. They will be receiving the new transport units in their areas of the state when the changes are implemented. I have described the problem to them and explained what the changes will be. They have taken this information to meetings with their employees to prepare them for the new look of the transports and the process by which they will have to raise and lower the axle. The operators of these fire suppression units are well aware of the weight issues we have been experiencing over the last several years as bulldozers have been getting heavier and heavier. They have been expecting a change to the transports for quite some time, so these new units will not come as a shock to anyone.

Evaluation Method

After receiving the new transport units with the lift 3rd axle, we will load them with the Caterpillar D4K2 dozer that they will be hauling and have them weighed. We expect to see a reduction of at least 6,000lbs in the Drive Axle Weight measurement. This will put us comfortably under most weight restrictions which normally run 34,000lbs per set of tandem axles.

After this process is completed, we will have to do some turning tests on the trucks to make sure the 3rd axle has not limited the truck's turning ability. This should be overcome by lifting the 3rd axle in tight turns. This will also reduce the amount of damage done to the tires on the 3rd axle as they would be sliding across the pavement in these tight turns.

Over the first year of service, we will continue to monitor the wear on the tires as well as the wear on suspension components on the entire transport vehicle. Spreading the load out over 3 rear axles should cause less stress on all suspension components under the vehicle.

Summary and Recommendations

Since 2012, the South Carolina Forestry Commission has worked to put its firefighters in the safest bulldozers possible for wildfire suppression. We have added enclosed cabs with tempered glass, air conditioning, and air filtration. We can now track the location of each enclosed cab bulldozer so we know where each firefighter is at all times when suppressing a fire. All of these things are great when we are on the scene of the fire, but we have to get the firefighter and the equipment to the fire legally and safely first. That is why it is imperative that we make these changes to the transport trucks sooner rather than later.

In March of 2017, one SC Forestry Commission fire suppression dozer was dispatched to Oklahoma for an outbreak of wildfires they had that spring. The dozer responded over 1,100 miles and 5 states to get to the Northwest portion of Oklahoma where the majority of the fires were being reported. On the way back home, the 2 firefighters assigned to the dozer were driving through Mississippi and had to stop at an interstate weigh station. Their unit was found to be 6,000lbs over the legal weight limit in the state of Mississippi. They were sent on their way without a citation for this violation, but it illustrated the need for change in these transport

vehicles. If we send someone to a fire 2 miles from their house, or if we send someone to fires 1,100 miles away, we should be sending them in legal equipment that is as safe as it possibly can be. We owe that to the men and women of the South Carolina Forestry Commission that protect our land, property, and our lives each fire season.

Photo #1 - 10-Wheel Straight Truck Configuration



Photo #2 - 18-Wheel Tractor Trailer Configuration



Photo #3 – Florida Division of Forestry Unit with 3rd Axle



Photo #4 – Fire Suppression Farm Tractor (circa 1942)



Photo #5

Road Machinery



- Road Machinery – 90,000 lbs.
- Axle(s) weight is exempt
- On & Off the Interstate Highway System



fppt.com

References

1. Dill, Dean. Interview. Captain. State Transport Police. 11/22/17
2. SC Code of Laws 48-37-10 to 48-37-60

- SECTION 48-37-20. Terms of compact.

ARTICLE I.

The purpose of this compact is to promote effective prevention and control of forest fires in the southeastern region of the United States by the development of integrated forest fire plans, by the maintenance of adequate forest fire fighting services by the member states, by providing for mutual aid in fighting forest fires among the compacting states of the region and with states which are party to other regional forest fire protection compacts or agreements, and for more adequate forest protection

3. US Code > Title 23 > Chapter 1 > § 127 (r)

- (r) Emergency Vehicles.—

(1) In general.—Notwithstanding subsection (a), a State shall not enforce against an emergency vehicle a vehicle weight limit (up to a maximum gross vehicle weight of 86,000 pounds) of less than—

- (A) 24,000 pounds on a single steering axle;
- (B) 33,500 pounds on a single drive axle;
- (C) 62,000 pounds on a tandem axle; or
- (D) 52,000 pounds on a tandem rear drive steer axle.

(2) Emergency vehicle defined.—In this subsection, the term “emergency vehicle” means a vehicle designed to be used under emergency conditions—

(A) to transport personnel and equipment; and

(B) to support the suppression of fires and mitigation of other hazardous situations.